How Much of Earth's Surface is Covered with Water?

Hands on activity

NGSS standards alignment:
This activity exposes participants to aspects of the following NGSS Disciplinary Core Ideas:

- K-ESS3-3 Earth and Human Activity
- 2-LS2 Ecosystems: Interactions, Energy, and Dynamics
- 2- ESS2 Earth's Systems
- 3-ESS2 Earth's Systems
- 4-ESS2 Earth's Systems
- 5- ESS2 Earth's Systems
- MS-ESS2 Earth's Systems
- MS-ESS3 Earth and Human Activity
- HS-ESS2 Earth's Systems
- HS-ESS3 Earth and Human Activity

They will also be engaged in the following Science and Engineering Practices: Asking questions, Developing and using models, Planning and carrying out investigations, Analyzing and interpreting data, Using mathematics and computational thinking, Constructing explanations, Engaging in argument from evidence and Obtaining, evaluating, and communicating information

Activity Overview: This is a good introductory activity to use when teaching participants of any age about Earth's water. It is a hands-on kinesthetic activity which enables participants to predict how much water is on Earth's surface, use a finger they select as a "data collector" to collect data on where there is water or land on Earth's surface, and the use of a data table to help them keep track of trends and patterns in the data.

Materials needed:

- Plastic blow up globe
- Chart paper/write board
- Markers to write with on paper or whiteboard
- Pens for participants to use to mark which finger will collect data
- 2 Plastic cups
- Eye dropper/pipette
- Enough water to fill cup 73% full

Directions:

Ask the participants what all living things on Earth need to survive, and write down their responses. They should mention water. Tell them that life as we know it needs water to survive, and as scientists look for evidence of life on other planets or moons, they are always looking for a location that could have water.

Write down "*Our Predictions*" on the paper/board, and ask them to predict about how much of Earth's surface is composed of water. Write down their predictions in the form of a range- lowest to highest. Explain that they will do an investigation using the plastic globe as a model of Earth. Tell them in science and engineering, models to take the place of real things that might be too large, too small, or too dangerous to use the real thing. Ask how they know the globe is standing in for Earth, and elicit their observations about what they see on the surface. Talk about where on the globe they see water or land. Help them decide where they would classify clouds and snow.

Have them select one of their ten fingers to be their "*data collector*". They need to make a tiny pen mark on that finger so they remember which one they selected. Then model gently tossing up and catching the globe, and show them what your "*data collector*" landed on.

Put the following headings on the paper/board, and tell them they will be gently tossing and catching the globe, and calling out whether their data collector is on land or water. Write "*Water*" and "*Land*" as headings. Explain there will be 20 tosses, and at the end of that first "trial", they will look at the data and see if they want to change their prediction's range. Toss the globe to someone, and make a tally when they call out either "land" or "water".

Tip: A good practice is to have participants get in a large circle and toss the globe, and have them step out once they have had a turn in order to ensure everyone gets a chance to catch and toss the globe.

Repeat this at least twice- as scientific investigations always have more than one trial. Have 20 data collections per trial (catching and identifying whether it is land or water under their "data collector") and mark the tallies under the "trial". While the participants probably won't have the attention span or need to do 100 trials, you can explain that if they did five trials, they would have 100 data points.

After each trial, see if they want to modify the range of the predictions to reflect the new data. This activity will generally give results which fall somewhere between 15-20% land and 75- 80% water, which is pretty close to the actual estimates for the ratio of land to water on Earth's surface.

Here is an example of what to put on the board/paper to begin the activity.

We predict that there is _____ % water and _____% land on Earth's surface.

Trial	Water	Land	Ratio
1			
2			
3			

Here is an example of what the data might look like after 1 trail:

We predict that there is *40 to 90* % water and *15 to 50*% land on Earth's surface.

Trial	Water	Land	Ratio
1	𝍸 𝍸 𝍸	𝍸	15:5

After you do each trial, ask the participants if they want to make any changes to their prediction ranges. Tell them that as scientists gather more data, they can use the patterns and trends to help modify their predictions.

Do at least two trials, and continue to look for patterns and trends in the data.

After you finish doing this activity, explain that scientists have found that about 73% of Earth's surface is covered with water. Show them the empty plastic cup, and tell them that this cup will serve as a model of Earth's surface, and fill it up about 73% full. Ask how much of this water they think is actually freshwater, rather than salt water. Take an eyedropper or pipette (if you don't have one you could pour a few drops into your hand or into a different cup) to demonstrate that less than 2.5% of all Earth's water is actually freshwater.

Here is a nice graphic that illustrates how little of Earth's water is actually freshwater.

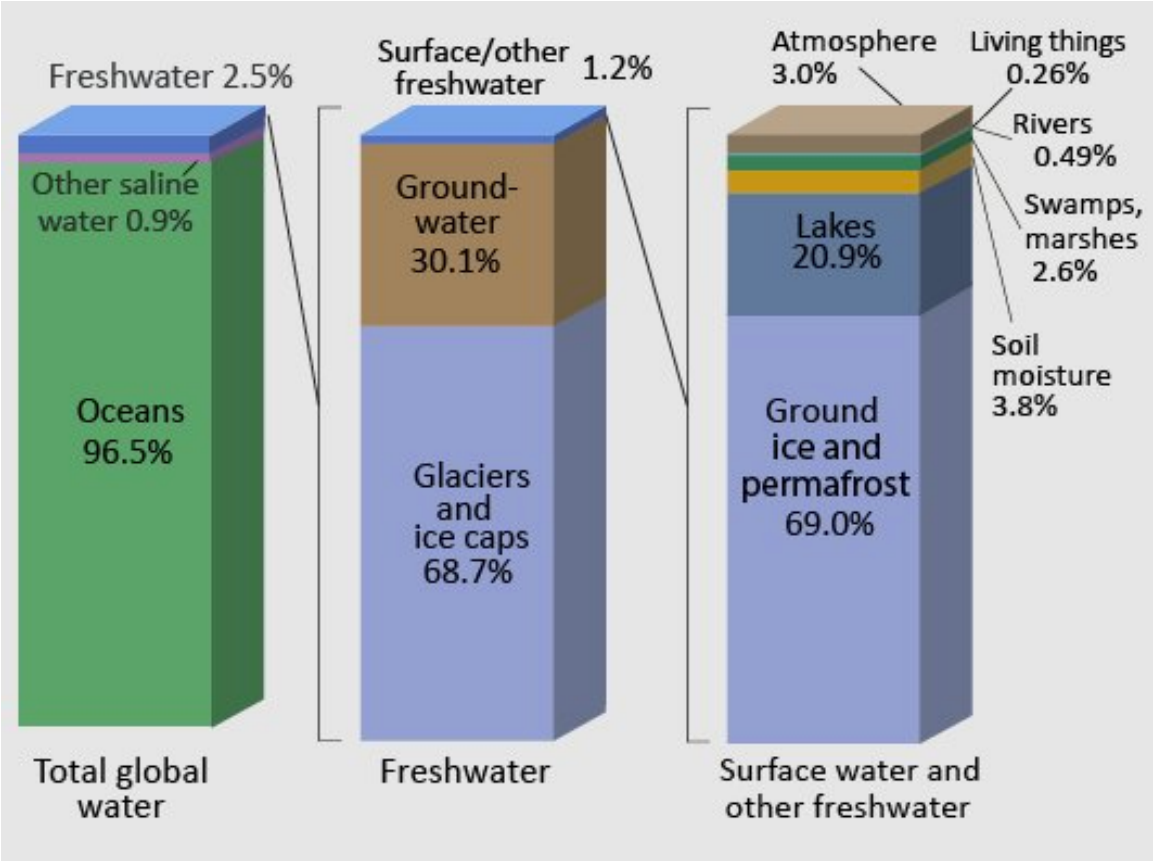

Figure 1:DistributionEarthWater.jpg Image credit: NASA

There are many resources related to Earth's freshwater resources. This is a good online interactive "webquest" to explore this topic in greater depth.

Many good resources to learn more about Earth's water and the water cycle can be found on the Precipitation Education website here.